

# Stock Market Analysis + Prediction using LSTM Report

## Overview:

The project aimed to create an accurate stock price prediction model using historical data from Apple, Google, Microsoft, and Amazon technology companies. The primary approach involved leveraging a Long Short-Term Memory (LSTM) neural network, a type of recurrent neural network (RNN), for its ability to capture temporal dependencies in sequential data.

## Data Collection:

Utilising the Yahoo Finance API, historical stock data spanning the last year was collected for the selected technology companies. The data included daily closing prices, adjusted closing prices, and trading volumes. This comprehensive dataset served as the foundation for developing the predictive model.

## Data Preprocessing:

A two-step preprocessing approach was applied to prepare the data for model training. Firstly, the closing prices were scaled using MinMax scaling, transforming them to a range between 0 and 1. Secondly, the dataset was split into training and validation sets. Sequences of 60 days were created for training, ensuring the LSTM model had sufficient context for making predictions.

## LSTM Model Training:

The LSTM model, implemented using PyTorch, was trained over 100 epochs. The model architecture consisted of an LSTM layer and a linear output layer. The Mean Squared Error (MSE) loss function was minimised using the Adam optimiser during training. This iterative process allowed the model to learn patterns and relationships within the sequential stock price data.

## Evaluation:

After training, the model's performance was evaluated on a validation set. Predictions were generated for the validation data, and the Root Mean Squared Error (RMSE) was

calculated. The RMSE was a quantitative measure of the model's accuracy, indicating the average magnitude of prediction errors.

## Visualisation:

The training and validation data, alongside the model's predictions, were visualised using Matplotlib. Plots showcased the ability of the model to capture trends and patterns in stock prices, providing a visual assessment of its predictive capabilities.

## Results:

The LSTM model demonstrated promising results in predicting stock prices. The RMSE, while indicating a reasonable level of accuracy, also suggested areas for potential improvement. Fine-tuning hyperparameters and exploring additional features could further enhance the model's performance.

## Next Steps:

The project could benefit from experimenting with hyperparameter tuning to optimise model performance. Exploring additional features and incorporating technical indicators might provide a more comprehensive understanding of stock price movements. Furthermore, considering the deployment of the model in a real-time stock prediction system would be a logical progression for practical application.